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ABSTRACT

This chapter presents a review of the latest research on advance organizers, and provides instructions for constructing and using them. The theoretical background of the advance organizers research is presented, beginning with the work of Ausubel, and this work is related to the writings of Piaget. An outline of advance organizer research is then given, including the latest studies and controversies over when and how to use advance organizers. Procedures for the construction of advance organizers are discussed and a checklist for determining the effectiveness of an organizer is provided. (19 references) (Author/EW)

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Chapter 20

Advance Organizers: Their Construction and Use in Instructional Development

John Newell

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Behavioral objectives, evaluation, media selection, and proper reinforcement scheduling are not adequate to ensure learning. The design of appropriate learning strategies, and their incorporation into the learning materials, lectures, discussions, laboratory exercises and other interactions between the student and the instructional system are necessary if the learner is to achieve the terminal objectives.

One learning strategy which has received a great deal of attention is the use of advance organizers. Advance organizers are small units of instruction which are presented in advance of the central unit of instruction. These small units are not introductions or overviews, but are units which prepare the learner's cognitive structure for receiving and integrating the new content.

The ability to design such a learning tool would seem to be of great value to an instructional developer.

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INTRODUCTION

The fundamental idea associated with the advance-organizer concept is quite simple and logical. An advance organizer is content which is presented in advance of some other content which is to be learned. The advance organizer is designed to facilitate the learning and retention of the material which follows it. The advance organizer serves as a bridge or anchorage, relating the material to be learned to information already known by the student. Despite this apparently rather logical and straightforward conceptualization of the role of an advance organizer, there has been a consistent history of debate and controversy surrounding it. There have been reviews of the research which has been conducted on the advance organizer, concluding that advance organizers do not facilitate learning and retention to any significant degree. Other reviews have challenged these conclusions. Questions have been raised about the specific attributes or characteristics of an advance organizer, and it has been argued that little is known about how to construct an effective advance organizer.

Despite all of the debate and controversy surrounding the advance-organizer concept, two general comments appear to be beyond debate. First, the advance organizer continues to be both a popular instructional strategy and the object of continuous research efforts in a wide variety of educational settings; and, second, existing research is able to tell us a number of fundamental facts about the structure and attributes of advance organizers and their value in instructional development.

The purpose of this chapter is to review briefly the theoretical and historical roots of the advance-organizer concept, to summarize some of the most relevant research on the advance

organizer, and, finally, to analyze existing evidence concerning the construction and application of advance organizers in a number of instructional settings.

THEORETICAL BACKGROUND:

The advance-organizer concept was originally introduced in the 1950s by Dr. David P. Ausubel (1963), who is also credited with coining its name. Before reviewing some of the more basic beliefs and assumptions associated with advance organizers, it is important that the reader have an appreciation of the historical milieu surrounding their development, since this history has contributed, in part, to the debate and controversy concerning them. At the time when Ausubel first introduced the advance organizer and his supporting research in The Psychology of Meaningful Verbal Learning (1963), American psychology had embraced the behavioristic position of B. F. Skinner. Behaviorism not only focused upon observable and measurable behavior, but also rejected as unscientific any use of "internal" mechanisms such as memory, thinking, or information processing in describing how individuals learned. Ausubel was clearly ahead of his time in developing this theory of learning, and his ideas and concepts were not well-received by the bulk of American psychologists.

The advance-organizer concept was clearly non-behavioristic and focused upon an information-processing approach to learning. Ausubel's approach is built upon the belief that the information-processing system of humans is composed of a set of ideas which provides an anchorage for new information as it is received (learned). These ideas also provide a storehouse for new meanings when they are acquired. This repository of new and old ideas is called the cognitive structure. Cognitive structure is a hypothetical mechanism in which past learning is stored and held for later recall and in which new ideas are processed and finally stored. Ausubel argued that new ideas and concepts can be learned effectively only to the extent to which they can be related to already-existing concepts and ideas in the cognitive structure, which provide the necessary anchorage for this new information. Ausubel expressed this fundamental position most eloquently in the introduction to his book, Educational Psychology: A Cognitive View (1968) when he stated: "If we had to reduce all of educational psychology to just one principle, we would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly." In addition to being the repository of ideas and concepts, cognitive structure is also where new information combines with information which already exists. The role of the classroom teacher, then, is to transmit an organized set of concepts in a way that allows the learner to incorporate them into his existing knowledge, so that the new information becomes an integral part of the individual's knowledge-system. Stated another way, cognitive structure serves as the major mechanism in the processing of new information and in its integration with existing ideas and concepts.

Ausubel believed strongly that each academic discipline, such as English, history, and the like, is composed of a structure of concepts which form the core of that discipline. These concepts are organized within each discipline in a hierarchical manner from general to specific. Ausubel believed that each discipline had its own unique organization of concepts, and that it is therefore inappropriate to apply the organization of one discipline to the analysis of a different discipline. Instead, he argued that the teacher must examine each discipline and discover the unique organizational structure of concepts associated with that discipline. He argued that the combining of different disciplines into a "core program", such as the combination of English and social studies, violates the uniqueness of the structure of these two disciplines and results in ineffective learning and retention. Finally, Ausubel believed that the structure of each discipline is hierarchically organized from general to specific. He pointed out that, "Generally speaking, therefore, it makes good organizational sense if the presentation of more detailed and specific information is preceded by a more general or inclusive principle to which it can be related or under which it can be related or under which it can subsumed" (1978b).

Unlike many other approaches to learning, Ausubel developed his theoretical position in order to explain the kinds of learning that occur in the classroom rather than those which occur in the research laboratory. Ausubel, more than any other educational psychologist, attempted to develop a view of learning which was based upon classroom learning. As a result of this focus, Ausubel distinguished between "rote" and "meaningful" learning. He believed that meaningful learning was subject to different rules than was rote learning. He pointed out that the contents of materials learned by rote could not be related to ideas and concepts that existed in cognitive structure, since rote learning requires the learning of the material in an exact, arbitrary form. Meaningful learning, on the other hand, is relatable to prior knowledge in cognitive structure and does not have to be learned in an arbitrary manner. This is not to suggest that Ausubel believed that no rote learning occurs in the classroom. Learning the alphabet, the multiplication facts, or the capitols of the states in the United States are all examples of rote learning. These are learned through continuous practice and they are forgotten rather easily.

Not only is Ausubel interested primarily in meaningful learning, but he is also an advocate of reception learning, rather than of discovery learning. He described reception learning as the process in which the major content of what is to be learned is presented to the learner by the teacher in more or less its final form. Discovery learning, on the other hand, is viewed as the process where-

by the learner must discover the content of the material to be learned. Since Ausubel's reasons for favoring reception learning over discovery learning are associated with his views concerning the role of development in the learner, an explanation of his preference for reception learning will be presented with the discussion of his view of human development.

Finally, Ausubel is interested not only in learning, but also in the long-term retention of that learning. He felt that what is learned in the classroom should be available for recall by the learner at times well beyond the time of the actual learning.

At this point, the advance organizer concept should be given a more precise definition, one which stresses the relationship of advance organizers to the basic beliefs presented above. Ausubel defined an advance organizer as material presented at a higher level of abstraction, generality, and inclusiveness than the material to be learned (1978b). The reader may recall Ausubel's suggestion that material to be presented should be organized from general to specific. His definition of an advance organizer is consistent with that suggestion; the definition describes an advance organizer as being at a more general and inclusive level with fewer specific facts than the material to be learned.

An advance organizer is effective in the facilitation of learning and retention to the extent that the material in the advance organizer can be related to the material to be learned. As Ausubel has stated, find out what the learner already knows and start from there. Two types of organizers have been described, and their differences depend upon the relative familiarity of the learner with the material to be learned. When the material to be learned is quite unfamiliar to the learner, an expository organizer is used. The expository organizer is designed to provide general, superordinate concepts and prinicples which are already familiar to the learner and which will provide a bridge to the new material to be learned. The material may be unfamiliar to the learner for two reasons. First, it may be material which is difficult and complex and for which the learner has little if any past experience to which the new material can be directly related. A first introduction to computer programming is an example of this type of material. A second reason why the material may be unfamiliar to the learner is that the learner has low or limited verbal ability. The less-able learner often possess a more restricted and limited background of information and concepts in his cognitive structure. Such learners would benefit from a presentation, in the form of an expository advance organizer, of an organized anchoring structure of concepts; these would allow the learner to better relate the new material to the limited prior knowledge available in cognitive structure.

In those instances in which the material to be learned is somewhat more familiar to the learner, a comparative organizer is used. The comparative organizer functions to integrate the new material to be learned with basically similar concepts already in cognitive structure, and to increase or emphasize the differences between the new material and the already-existing ideas and concepts. The intent of a comparative organizer is to distinguish between two ideas that are basically different but which may be confused as being similar. The distinction between the "language experience" and the "phonetic" approaches to reading might be such an example. These two approaches may appear to be quite similar, but are, in fact, derived from quite different beliefs and approaches concerning the teaching of reading.

In all of the debate over whether or not advance organizers are effective in facilitating learning and retention, a basic fact about advance organizers has been ignored. Ausubel never claimed that there was anything absolute about an advance organizer or that organizers will always be effective in the facilitation of learning and retention. He has pointed out repeatedly that the overall effectiveness of an advance organizer is dependent upon three major factors. Ausubel stated, "Apart from describing organizers in general terms with appropriate examples, one cannot be more specific about the construction of an organizer; for this always depends upon the nature of the learning material, the age of the learner, and his degree of prior familiarity with the learning passage." (1978a). There is also some evidence that the ability level of the learner is an important factor. Since a good deal of the criticism of advance organizers has focused upon their construction, these characteristics of an advance organizer should be examined in greater detail.

It seems quite obvious that the nature of the content to be learned must be taken into account in constructing an advance organizer. First, the content or cognitive material to be learned must be meaningfully presented, and not in a form to be learned rotely. This characteristic has already been discussed. Second, Ausubel has pointed out that advance organizers probably facilitate the learning of factual material more than they do the learning of abstract material, since abstractions contain their own built-in organizers. (1978b).

While there has been no conclusive evidence presented to date, there are suggestions that the ability of the learner may be an explanatory factor in the facilitating effect of an advance organizer. One explanation for the relative facilitating effect of an advance organizer is that high-ability learners either already possess or are able to develop an organizing anchorage for either factual or abstract material. On the other hand, so the argument goes, low-ability learners neither possess nor are able to generate an organizing structure when learning new content.

Let us turn briefly to the third characteristic, the degree of prior familiarity with the learning passage. there is some general agreement

that advance organizers are most effective when the content to be learned is unfamiliar to the learner. The greater the degree of unfamiliarity, the less likely the learner is to be able to develop her/his own organizer, regardless of her/his ability level.

There have been some suggestions that the way in which the content to be learned is organized may have an impact upon the effectiveness of the advance organizer, but this has yet to be demonstrated in any conclusive manner. For example, the role of imagery-producing words in the material to be learned may be important, since high-imagery words are learned more easily and retained for longer periods of time. The whole issue of the relative effectiveness of visual-versus-written prose materials, and combinations of these two modalities, needs to be examined more closely as it relates to the effectiveness of advance organizers. Finally, the issue of whether to intersperse a number of organizers within the material to be learned needs further examination. Some evidence for this approach is discussed later in this chapter.

There is clear evidence that the age of the learner has an effect not only upon how advance organizers should be constructed but also upon their effectiveness in facilitating learning and retention. Since Ausubel has adapted Piaget's stages of cognitive development in discussing the effects of different ages upon learning, these stages should be presented briefly before returning to Ausubel. Piaget described the cognitive development of a child in terms of three major stages of development, each of which differs in significant ways from the other stages. The child must pass through each stage in succession, and the cognitive development in one stage serves as a prerequisite to the development which takes place in the next stage. A child does not enter or leave a given stage abruptly; a given stage gradually merges with the next higher stage of development over a period of time. A child may not skip a stage, and some individuals never reach the final stage of cognitive development. Ausubel has adapted Piaget's work by placing these stages on a concrete-abstract continuum. (1978b).

The first stage, the pre-operational stage, includes the pre-school years. In this stage the child is able to acquire concepts only if they are closely associated with concrete experiences. If there are no direct concrete references available to support the concept, the child is unable to deal efffectively with that concept. For example, in this stage of development, the child is unable to deal with concepts such as reversibility or conservation of mass in any real sense. During the pre-operational stage the child experiences the world about him, and an exposure to as many different experiences as possible will provide a firm foundation upon which future cognitive structure is built. While Ausubel has argued for the general efficacy of reception learning over discovery learning, it is in this pre-operational stage that guided-discovery learning is most effective. The use of guided-discovery activities, such as visits to the zoo and to the grocery store, or exposure to picture books, will expand the experiential background of the learner. This early intellectual stimulation provides the beginnings of elements in cognitive structure which will serve as a basis for the more complex development of abstractions, concepts, and priciples in a later developmental period. Ausubel points out that inthis pre-operational period, the child is capable of employing primary concepts, but not secondary concepts. Ausubel defines primary concepts as, "...those concepts whose meanings a given individual originally learns in relation to genuine concrete-empirical experience." (1978b). The important element here is the requirement that the concept be directly related to some concrete-empirical experience. At this stage of development, the child is not capable of learning secondary concepts which s/he can not relate directly to concrete experiences.

The next stage of development is called the concrete-operational stage, and usually occupies the elementary school years. In this stage of development the learner begins to deal with concepts which are not directly associated with concrete experiences. That is, the learner begins to deal with secondary concepts, rather than just with primary ones. Ausubel defines secondary concepts as "...those with meanings a given individual does not learn in relation to genuine concrete-empirical experience; that is, those concepts whose criterial attributes yield generic meanings during learning when these attributes are related to the individual's cognitive structure without being first explicitly related to the particular exemplars from which they are derived." (1978b). Ausubel points out that in the concrete-operational stage the learner begins to depend less upon concrete props in developing concepts. The learner is able to develop a concept from a single concrete prop rather than being dependent upon several concrete props; the concrete props appear to serve more as a "crutch" in developing concepts rather than being the primary source of the attributes of the concept. Thus the learner is now able to deal more effectively with abstract concepts such as reversibility and conservation of mass. Advance organizers for learners in this stage of development can be more abstract and inclusive than for learners in the previous stage, but concrete props must still be included. The final stage is called the abstract-logical stage and is associated with the junior high (middle school) and high school years. It is in this stage that the learner demonstrates his ability to deal with the world in terms of abstract concepts; the dependence on concrete props decreases dramatically. An important aspect of this stage of cognitive development is the ability of the learner to go beyond the "here and now" and to deal with the future, the possible, and the consequences of their actions and can, in their imagination, work through a problem in the absence of any concrete props. Advance organi-

zers for this stage of development can be more abstract and inclusive than for the previous stages and need not include concrete props.

The three developmental stages just discussed are related to the chronological age of the learner. As a learner increases in cognitive maturity and moves from one stage to the next, the ability of the learner to interact with the world in terms of abstract concepts increases, and advance organizers must reflect his increased ability to think abstractly. This increase in cognitive maturity also results in a more complex cognitive structure having more concepts available which can be related to new material as it is learned.

Earlier in this chapter, it was stated that Ausubel preferred reception learning to discovery learning. It should be clear that, in terms of the stages of cognitive development just presented, the young learner who is in the pre-operational stage will benefit from a broad exposure to the concrete events of the environment. These experiences will constitute the beginnings of cognitive structure, but will not be organized into concepts except at the most simple level. This exposure to the environment can best be accomplished by guided-discovery teaching-strategies. When the learner is able to deal with the world at the abstract-logical state (using such abstract forms as reading material and lectures) the most effective teaching strategy becomes reception learning. The learner at this stage possesses the ability to deal with the world through abstract concepts, has a more complex cognitive structure that can be related to new learning, and is not dependent upon concrete exemplars of the concept. As Ausubel pointed out, under these circumstances it is more efficient and effective to "tell" the learner what you wish him to know, rather than require him to discover this information on his own. Ausubel described meaningful reception learning as follows: "...symbolically expressed ideas (which) are related in a nonarbitrary and substantive fashion to what the learner already knows. By substantive and nonarbitrary relatedness we mean that the ideas are related to some specifically relevant existing aspect of the learner's cognitive structure, such as an image, an already-meaningful symbol, a concept or proposition." (1978b). The two terms "nonarbitrary" and "substantive" are central to Ausubel's distinction between meaningful and rote learning. By nonarbitrary, Ausubel is referring to the characteristics of the learning content that makes that content relatable to what already exists in cognitive structure. There is nonrandomness in the material; that is, there is an inherent structure to the content which the learner can perceive or find, at least potentially. It follows recognized rules of syntax and grammatical construction. An example of arbitrary learning material would be nonsense syllables, such as XUV, which follow no recognized rules of syntax or grammar and cannot be directly related to existing cognitive structure. Thus it must be learned rotely in a verbatim fashion. Nonarbitrary learning material may, at first, be non-meaningful, or as Ausubel described it, only potentially meaningful. A passage of Russian prose for a student with no prior knowledge of Russian would be potentially meaningful. Once the student has sufficient vocabulary and the rules of grammar for Russian in her/his cognitive structure, then the Russian prose passage can be directly related to cognitive structure in a non-random way.

The term "substantive" is closely related to the characteristic of nonarbitrary. By "substantive" Ausubel is referring to the characteristic of the learning material that allows it to be related to cognitive structure without a loss or change in meaning. If the concept to be learned can be restated in words other than those in which it was originally presented without changing its meaning, the requirement that the learning material is substantive has been met. In the case of the nonsense syllable, XUV, it is not only learned in an arbitrary and exact manner, but there is no possibility of restating XUV in any other way and retaining whatever meaning that nonsense syllable may possess. On the other hand, the translation of a passage of Russian prose can be done according to recognized rules of syntax and grammar, and the translation can be performed in a number of different ways without the loss of the meaning of that passage.

The central task of the teacher, then, is to present content to the learner using reception learning. This content should be presented in such a way that it has the potential for being meaningful; that is, in such a way that the material can be directly related to what already exists in cognitive structure and which can be recalled at a later time in a number of different ways without the loss of the meaning of that material. Ausubel has summarized the task of the teacher as folows, "Precise and integrated understandings are, presumably, more likely to develop if: (1) The central unifying ideas of a discipline are learned before more peripheral concepts and information are introduced; (2) The limiting conditions of general developmental readiness are observed; (3) Precise and accurate definition is stressed, and emphasis is placed upon delineating similarities and differences between related concepts; and (4) Learners are required to reformulate new propositions in their own words." (1978b).

Before examining some of the research evidence relating to advance organizers, the reader should be aware that what has just been presented has focused exclusively on the advance-organizer concept and represents only a very small part of Ausubel's total theory of meaningful learning. The way in which new learning material is related to existing cognitive structure, the assimilation of that new information into what already exists in cognitive structure, and the procedures used to recall material that has been learned, are part of Ausubel's theory, but have not been presented here. The advance organizer concept has received considerable attention in the research literature and in

instructional development, but this concept is only a small part of Ausubel's position.

RESEARCH BACKGROUND

The research which has examined the facilitative effects of advance organizers upon learning and retention is extensive, confusing, and contradictory. In the following section, a small sample of the existing research evidence will be presented and the reader will, no doubt, sense the confusion and contradictions that exist. It would be impossible to adequately review all of the existing research literature. Fortunately, there are a number of summaries and literature reviews which make this author's task much easier. Before examining the findings reported in these summaries, two representative advance-organizer studies will be presented in order to provide the reader with the flavor of the types of studies conducted in research on advance organizers, and of the types of questions these studies ask.

One of the most frequently cited studies on advance organizers was reported by Ausubel in 1960. He describes the purpose of his study as follows: "The purpose of this study is to test the hypothesis that the learning and retention of unfamiliar but meaningful verbal material can be facilitated by the advance introduction of relevant subsuming concepts (organizers)." Ausubel asked 100 seniors in an educational psychology class to read a 2500-word passage dealing with the metallurgical properties of plain carbon steel. Previously Ausubel had determined that this topic was generally unfamiliar to undergraduate students in liberal arts and sciences. One group of subjects received an experimental introductory passage, an advance organizer, of approximately 500 words prior to being exposed to the passage on carbon steel. Ausubel describes this organizer passage as follows: "It was designed to serve as an organizing or anchoring focus for the steel material and to relate it to existing cognitive structure, but not to contain information that would provide a direct advantage in answering any of the questions on the steel test." A second group of subjects received an introductory passage which consisted of historically relevant background material on the manufacture of steel. Both groups studied the passage on plain carbon steel for about one-half hour, and three days later took a multiple-choice test over it. Ausubel reported statistically significant differences in mean test scores in favor of the group which had read the advance organizer when compared with the group that had read the historical passage.

A similar study was reported by Kuhn and Novak (1971). The effects of an advance organizer and of an historical passage on the learning and retention resulting from a laboratory experience in biology were compared. The concept being taught was homeostasis. One group was given an 800-word organizer which dealt with the way in which a float in a water tank could be used to regulate and balance the flow of water in and out of the tank by opening or closing an outlet valve. The historical passage given to a second group described a part of the life of Dr. Claude Bernard, involving his work on homeostatic balance. Both groups read the appropriate passage for about fifteen minutes on two different occasions together with the learning passage. A twenty-question multiple choice test was given at the end of the learning session and again after the delay of three weeks. Kuhn and Novak reported that they found no significant differences in the mean test scores for the two groups on the test given immediately after completion of the learning experience, but that there were significant differences in mean test scores for the two groups on the three-week delay condition in favor of the group which had read the advance-organizer passage. They concluded that the results of their study provided support for Ausubel's model of learning and the facilitative effects of advance organizers upon learning and retention.

The study by Ausubel and the one by Kuhn and Novak were discussed in order to illustrate the basic research design used in many advance-organizer studies. In general they are two-group studies in which one group is exposed to an advance organizer followed by a learning passage, while the other, or control group, is exposed to an historical passage followed by a learning passage. In both of the above studies the materials used for the learning passage were meaningful prose materials which were unfamiliar to the students in the experiment. This degree of unfamiliarity was established in both studies by pre-testing the learners on the material. The Kuhn and Novak study examined immediate retention of the material as well as delayed retention. Ausubel examined only delayed retention. In the delayed retention situation, the differences in test scores were in favor of the advance organizer group. Many other studies have supported the finding that organizers have their maximum impact with delayed-retention situations.

There have been a number of reviews critical of the claims of facilitative effects of advance organizers. Ring and Novak (1971), and West and Fensham (1974), have both offered cirticism of advance organizer studies. More recently Barnes and Clawson (1975) presented a review which they summarized by stating, "We must conclude from this review that advance organizers, as presently constructed, generally do not facilitate learning." Barnes and Clawson selected thirty-two different studies of advance organizers and then classified them according to a number of variables, such as ability level of subjects, length of treatment, and grade level of the subjects, in an effort to see if any consistent patterns of results emerged. This was an analysis in which studies were assigned to a category based upon a single variable. In examining the effects of the length of the treatment, which included the delay-in-retention measures, they reported that no clear patterns

emerged and that length of treatment was apparently not a critical variable in ascertaining the facilitative effects of advance organizers.

Earlier in this chapter, the effects of ability level upon the facilitative action of advance organizers was discussed. In their review, Barnes and Clawson could identify no significant trends suggesting that advance organizers might be more facilitative with students of one ability level than of another. The same negative conclusion was presented when the studies were classified according to the grade level of the subjects in the study. Barnes and Clawson did note that the majority of studies being reviewed used subjects who were in high school or college, and that only two studies were found which used younger-aged students.

Barnes and Clawson also offered a number of recommendations for the development of further studies which would, hopefully, address some of the issues rasied in their review. They pointed out, for example, that studies should be conducted which involved a delay-in-retention longer than the typical ten-day period, in order to determine if delayed retention was indeed facilitated by advance organizers. They also suggested that studies be done under controlled conditions using learning materials at different levels of the cognitive domain.

As would be expected, there were a number of reactions to the Barnes-and-Clawson findings, both supportive and critical of their conclusions. One of the more carefully-reasoned responses was presented by Lawton and Wanska (1977). After a careful review of Ausubel's theoretical position as presented by Barnes and Clawson and as presented by Ausubel, Lawton and Wanska presented a detailed critique of statements made in the Barnes and Clawson article. They concluded that the major contribution of the Barnes-and-Clawson review was that it demonstrated clearly the confused picture of the status of advance-organizer studies.

Lawton and Wanska took Barnes and Clawson to task for using the single-variable classification approach, claiming that this approach has limited value at best. "For example," they argue, "although a group of studies may be 'similar' in terms of utilizing a written organizer, they may be very diversified in terms of subjects' age or ability level, length of treatment, or subject-matter taught. Nevertheless, the authors treat them as comparable studies." It is clear that Lawton and Wanska feel that this one-variable approach was not only simplistic, but that it was not liekly to yield findings which would contribute in a meaningful manner to our understanding of the function of advance organizers in the facilitation of learning. They make a final comment which indicated that there were variables that Barnes and Clawson might have taken into account, but did not. They concluded that, "Before we ask whether organizers facilitate learning, more definitive and stringent tests of the structure of organizers are required." The attributes of advance organizers have, in fact, received little attention until recently. These attributes, in-so-far as they have been isolated, will be discussed further in the last section of this chapter.

If the variable-by-variable approach to the analysis of the effects of advance organizers does not seem promising, another approach is more promising; that is, to compare advance organizers with other pre-instructional strategies in terms of their effect upon learning and retention. The reader may remember that Ausubel described an advance organizer as being at a higher level of abstraction, generality and inclusiveness than is the material to be learned. Ausubel has also indicated that an advance organizer differs from an overview in that the latter may be presented at the same level of abstractness, generality and inclusiveness as the material to be learned.

In an interesting series of comparisons, Hartley and Davies (1976) analyzed some of the research findings on the role of pretests, behavioral objectives, overviews and advance organizers. They based their article upon the following premise: "In designing and using teaching materials, therefore, a great deal of thought and care is usually given to choosing the best way of preparing students for, and introducing them to, new and unusual situations and knowledge. This is usually accomplished by means of some kind of introductory statement or pre-instructional strategy, which serves to preface the teaching to come...These four preinstructional strategies, unfortunately, have been viewed in isolation from each other, as well as from the type of teaching that they introduce." For those who believe that these four pre-instructional strategies serve essentially the same role in learning, Hartely and Davies counter by saying that "Although pretests, behavioral objectives, overviews, and advance organizers all serve a pre-instructional role, there are essential differences among them in both form and function. These differences reflect different sets of assumptions about learning and teaching. They suggest different theoretical positions rather than variations in style."

Hartley and Davies go on to describe the major characteristics of each of the four pre-instructional strategies and present the research evidence to support the effectiveness and limitations of each strategy. They summarize their findings with the following description: "In this sense, pretests alert, behavioral objectives inform, overviews prepare and advance organizers clarify." In comparing advance organizers to the other three pre-instructional strategies, Hartley and Davies argued that "...advance organizers emphasize context, whereas content is the controlling feature of pretests, behavioral objectives, and usually overviews." This analysis is consistent with the generally accepted view of advance organizers as pre-instructional strategies which do not provide specific content, but instead provide a broad, general frame of reference or anchorage which the

student can employ in attempting to understand the material which follows.

The Barnes and Clawson, the Lawton and Wanska, and the Hartley and Davies articles have all focused upon the conditions under which advance organizers are effective in aiding learning and retention. The next two articles to be discussed provide interesting alternative approaches since they, in different ways, focus upon some of the critical aspects of advance organizers. The reader may recall that one of the guiding principles of Ausubel's approach to learning is that the material being learned must be meaningful to the learner. One of the confounding variables in using such meaningful material is the question of how much do the students already know about the topic. Many studies have attempted to control for prior knowledge through the use of learning materials which were in the judgment of the experimenter, unfamiliar to the students. In an interesting attempt to verify Ausubel's belief that subject-matter is learned best when it is presented in a hierarchical manner, Merrill and Stolurow (1966) developed an imaginary science for their learning materials. Their article is of interest not only because it examines a fundamental aspect of Ausubel's theory but also because it, for all practical purposes, used nonsense syllables as the vocabulary for the learning materials. Briefly, the material dealt with the Xenograde System. The students were asked to solve problems dealing with the relationship of microns/alphon, blips and satellites from a prepared table of values. Such values did not exist but were constructed for the purpose of this study. The interesting aspect of this approach is that the terms used were presented in a manner that made the material appear to be potentially meaningful and logical. Its advantage, of course, was that knowledge already existing in the subjects' cognitive structures would not be useful to them in learning this material.

The major purpose of the study was to examine the variable, type of presentation of material. Three approaches were used: The hierarchical organization, a general review procedure and a specific review procedure. Merrill and Stolurow described the purpose of the study as follows: "Based upon Ausubel and Gagne, it was hypothesized that subjects who received a hierarchical presentation would make fewer errors during learning and subsequent testing than would subjects who received a problem-oriented presentation of the same task." Their findings were viewed as being supportive of Ausubel's hierarchical position. They stated, "The results were as follows: "Being presented the summary prior to receiving the problems does **not** take significantly more time than when the summary is not presented, but it **does** increase the number of correct responses during the learning session and on the test."

The learning materials that have been used in most studies of advance organizers have been fairly long and have been presented as a prose passage. Learning passages have varied between 800 and 2,500 words in length and advance organizers have been between 200 and 800 words in length. Rickards (1975) introduced an interesting variation in the use of advance organizers by interspersing a number of 10 to 12 word advance-organizer statements within the material to be learned. In this approach, the subjects receive the advance organizers in short sentences at the same time that they are reading the learning material. This approach is not new. A number of textbooks place questions or problems to be solved periodically throughout the text. The intent is to aid the reader in summarizing and digesting the previous material before continuing. Not only does the reader receive the material to be learned simultaneously with the advance organizer; he is also exposed to a number of advance organizers, rather than just to one, which is the situation in most advance organizer studies.

Rickards added two other variations to his study. Most of the studies of advance organizers have used multiple-choice tests to measure learning and retention. Rickards reasoned that information related to advance organizers might be more easily inferred using a free-recall type of test rather than the multiple-choice format. He also varied the type of interspersed organizers from the most general and inclusive superordinate question to the most specific coordinate statement. A superordinate question required that the reader infer the answer from information provided in the text, while the coordinate statement was a statement of information contained in the text. The results of this study were clear and supported Ausubel's position on advance organizers. Rickards stated, "Of greatest importance was the finding that interspersed advance organizers yielded greater recall of the passage information than did either interspersed post organizers of interspersed coordinate pre-statements or post-statements." What Rickards found was that the superordinate statements yielded greater recall of passage information than did coordinate statements. Ausubel's description of an advance organizer as being more general and inclusive than the material to be learned appears to be supported by this study.

While the previous studies have provided a number of interesting and unique experimental approaches to the study of the effects of advance organizers on learning and retention, a number of studies have examined advance organizers from different theoretical positions. There has been a rise in interest and research in cognitive learning theory, and new modes for analyzing research results have been developed. A number of studies have drawn upon these recent advances to provide the beginnings of an integration of the claims and counter-claims concerning advance organizers.

Glass (1978) proposed a technique involving the "effect-size" statistic for comparing the effects of different experimental treatments across studies. This statistic does not employ the concept of statistical significance, but allows for the

analysis and comparison of differences in the effect of experimental treatments regardless of their magnitude. The use of the "effect-size" statistic allows for the identification of consistent treatment effects across a number of unrelated studies of the same phenomenon. Luiten, Ames and Ackerson (1980) employed Glass's "effect-size" statistic to examine the reported findings of approximately 170 studies of advance-organizer effects. Luiten, et al. described their procedure as follows: "In each of the studies analyzed, the most important feature considered was the magnitude of the effect of the advance organizer on learning and retention." They analyzed the findings of some 160 studies which employed different delay times between the presentation of materials and the testing of knowledge of these materials. Of interest is that 110 of these studies employed a delay of one day or less between the learning period and the testing period; Luiten, et al., define these as studies of learning. The remaining studies used delay times ranging from 2 to over 22 days; the authors define these as retention studies.

They reported the following results. "The mean effect-size for the advance organizer on learning would indicate that the average participant receiving the advance organizer treatment performed better than 58% of control-group individuals. A similar statement can be made for the average effect-size at each retention level. Interestingly, the retention-level data shows the advance-organizer effect to increase with time." Luiten, et al. conclude that the advance organizer does indeed have a small but consistent facilitative effect on learning and retention. Further, they pointed out that the effect size of the advance organizer treatment increased across time. These findings are viewed as supporting Ausubel's contention that (a) the advance organizer does have a facilitating effect on learning and retention, and (b) the most effective use of an advance organizer is for facilitating delayed retention rather than for facilitating more immediate retention.

Luiten, et al. also examined the influence of grade level on learning and retention. They identified studies in which students were drawn from colleges, secondary schools, elementary schools, and special education. They reported that for measures of learning, the effect size was greater for college and special-education populations, but for measures of delayed retention, the highest effect-size was found with elementary school populations. While the authors do not speculate on the reasons for such findings, there is a suggestion that the organizing and anchoring effect of the advance organizer may be more pronounced for those students whose cognitive structure is least well-organized.

In an attempt to identify the attributes of an advance organizer, Newell and Olejnik (in press) drew upon Paivio's (1969) work on imagery. Paivio and others had developed normative data concerning the attributes of imagery, concreteness, and meaningfulness for 926 nouns. Paivio argued that for concrete words, the influence of imagery was higher and the words would be remembered longer. Voss and Newell (1977) had developed a 20-item rating scale which identified the reader's perception of the imagery and concreteness values of prose passages. Newell and Olejnik reported a factor analysis of these ratings collected from advance organizer experiments which suggested that the advance organizer, the historical passage, and the learning material could be distinguished from each other using the rating scale. One of the interesting findings was that advance organizers and learning materials were rated almost the same, and historical passages were rated as significantly more abstract than the other two passages. Ausubel's description of an advance organizer as being more abstract than the material to be learned was not confirmed by this study. While the reasons for the differences in ratings is not clear, Newell and Olejnik did demonstrate that prose passages could be rated consistently on the dimensions of abstractness and imagery. While this study developed from an attempt to analyze an advance organizer using a different theoretical position, the demonstration of a stable and consistent rating system to describe the attributes of prose materials was viewed as a contribution to the attempt to describe the attributes of an advance organizer.

The final article to be presented here represents a comprehensive attempt by Mayer (1979) to relate the available research on advance organizers to three theoretical positions on learning and retention. After a brief review of some of the major findings from previous studies, Mayer described the three theoretical positions. The first theory presented by Mayer, Reception Theory, postulates that, "...test performance is a function of the amount of information that is received by the learner." Mayer concluded that "This theory predicts, for example, that if a test measures content from the instructional material, then presenting an organizer before, after, or not at all should have no effect on test performance." If Reception Theory is an appropriate description of learning, then the advance organizer should have no significant effect on learning, since this position focuses only on whether or not the learner received the information presented.

A second theory presented by Mayer is called Addition Theory. According to this position, "...more is learned if the learner possesses the proper prerequisite anchoring concepts." Mayer stated that "This theory predicts that presenting an organizer before learning should result in more learning than presenting the organizer after learning (or not at all), since only in the former case can the organizer provide the needed anchors." This position appears to be consistent with that of Ausubel. It is also supported by research which suggests that organizers presented **after** the learning material do not demonstrate the same degree of facilitation of learning as do organizers presented **before** the learning material. This

position suggests that reviews or summaries at the end of a unit will probably have little facilitative effect on learning and retention.

The final theory presented by Mayer is called the Assimilation-Encoding Theory. While this theory is similar in some ways to the Addition Theory, there are additional elements which Mayer beleives make the Assimilation-Encoding position more appropriate. In both the Reception Theory and the Addition Theory, the outcome of learning depends primarily upon how much of the presented material is stored in long-term memory. In the Assimilation-Encoding position, there is an active integration of the new information with existing knowledge, and the outcome of learning varies with the breadth of the learning and not merely with the amount of information received. Mayer then submits these three theoretical positions to a number of experimental tests based upon prior research findings in order to determine their adequacy in predicting the research findings. Mayer summarized this analysis by stating that "These results provide fairly consistent support for the predictions of Assimilation Theory regarding the effects of advance organizers on the outcomes of learning."

Of particular interest to the present topic are the findings presented by Mayer which attempt to define an advance organizer. Mayer cited the following:

1. "...organizers are always relative to the particular learner and subject matter." This conclusion seems to be consistent with the position presented earlier by Ausubel when he cited some of the conditions which would effect the outcomes of using advance organizers in learning.

2. An advance organizer is generally a "Short set of verbal or visual information, presented prior to learning a larger body of to-be-learned information, containing no specific content from the to-be-learned information, providing a means of generating the logical relationships among the elements in the to-be-learned information, and influencing the learner's encoding process." Mayer has restated some of the findings presented from other studies. In addition, he has pointed out that the advance organizer serves functions in addition to merely organizing the new material for the learner. Mayer concludes that the advance organizer also organizes existing knowledge in a way that makes the assimilation of the new material with existing knowledge easier and more effective. Only an Assimilation-Encoding position allows for this orgainzation of already-existing knowledge.

Before presenting a number of attributes which seem to be necessary for an effective advance organizer, a brief summary of the major findings of the research studies presented will be offered, since the research findings are often in conflict with one another, and the theoretical positions assumed by different research studies vary widely. Advance organizers are used in the learning of meaningful material such as the material presented in most classrooms. Advance organizers do not appear to have any significant facilitative effect upon the learning of materials by rote. Advance organizers are effective primarily when they are presented prior to or in advance of the material to be learned, since the role of the organizer is to organize both the material to be learned and the existing knowledge base of the learner. An advance organizer should be a series of superordinate concepts which are more general and inclusive than the material to be learned. This means that overviews or reviews, which are most often presented at the same level of inclusiveness and generality as the material to be learned, will not be as effective in the facilitation of learning as will advance organizers. The issue of whether an advance organizer must be abstract rather than concrete is questionable. Apparently, high-imagery words, regardless of whether or not they are abstract or concrete, facilitate learning and retention.

The variables which determine the overall effectiveness of an advance organizer are multiple and not unitary, so that the ages of the learner, the difficulty of the material and the prior existing knowledge of the learner must all be considered simultaneously in developing an advance organizer. The major reason why an advance organizer is effective is found in its organizing of the material to be learned and not in its relationship to the content of the new material. Organizers should not contain information that is also included in the material to be learned, but should present a general inclusive organizing presentation for the learner. Organizers can be long or short in length and can be used with long passages of learning material or interspersed throughout a prose passage. The more unfamiliar the material is to the learner, the greater the effectiveness of an advance organizer. An advance organizer produces greater measured effects with delayed retention than with immediate retention. Some studies have found that an advance organizer produced no significant effects at all with immediate retention.

DEVELOPING ADVANCE ORGANIZERS

Perhaps the best way to illustrate the development of an advance organizer is to consider an organizer this author uses in teaching an undergraduate course in educational psychology. As the reader will probably realize, these students know little about learning theory. Therefore, the situation is appropriate for the use of an advance organizer. In light of this, an advance organizer is used to introduce a unit on Ausubel illustrating the cognitive approach to learning theory.

The first step in presenting the unit is to explain "subsumption," one of the major principles in Ausubel's theory of learning. This principle describes how new material is related to already-existing material in cognitive structure. There are two major types of subsumption, depending upon whether the new material can be realted directly

to what is in cognitive sturcture, or not.

After explaining subsumption to the class, I present what appears to have the effect of an advance organizer. I ask the students to imagine that they have a bowl of Jello, with the Jello cut up into pieces. If they then add additional pieces of Jello from another bowl and stir this combined mixture, very quickly the new Jello will be indistinguishable from the original Jello. Furthermore, what they now have is more Jello, not different Jello; the structure of the original Jello in the bowl has not been modified very much.

I then ask the students to imagine another bowl of pieces of Jello. In this second case, we will add a handful of miniature marshmallows and stir the mixture. A number of things happen. First, even after some initial stirring, the new material (marshmallows) can still be distinguished from the Jello. Second, after the combination has been thoroughly mixed and blended, what we now have in the bowl is different from the original Jello. That is, we have a new combination in the bowl that represents the blending of the Jello and the marshmallows. Students appear able to visualize these two Jello mixings quite easily.

I tell my students to keep these two examples in mind as I proceed. I then point out that in learning, new material can often be related directly to what exists in cognitive structure, in much the same way that the bowl of Jello and the added Jello would combine, without significantly modifying either cognitive structure or the resulting bowl of Jello. This is called "correlative subsumption" by Ausubel.

At other times, the new material to be learned cannot be easily related to what exists in cognitive structure. When the new material (marshmallows) enters cognitive structure (the bowl of Jello), what exists in cognitive structure must be modified in order to accomodate the new material. Once this accommodation has been completed, what exists in cognitive structure is now modified. A new aspect of cognitive structure now exists in much the same way that the blend of marshmallows and Jello is a new mixture. This is called "derivative subsumption." An example of this occurs when the student learns algebra. The result is that the student can now think of the world differently; that is, algebraically and not just in terms of arithmetic.

While the "Jello organizer" certainly lacks elegance and scholarly background, the evidence from the students is that it works. It also reflects some of the fundamental characteristics of an advance organizer. First, it is an attempt to teach the students something that is quite unfamiliar to them and for which they have little in their cognitive structures to which the concept of subsumption can be directly related. The Jello examples are familiar to all of the students. Even though they may not have actually mixed Jello with Jello or Jello with marshmallow, they have had experiences with Jello and with marshmallows, and so can readily imagine what might happen. Second, the Jello organizer contains no specific information related to the process of subsumption. Of that I am certain. The blending of Jello and marshmallows is a rather general and inclusive kind of illustration which could be used to describe a number of different problems. That is, the organizer contains general and inclusive superordinate concepts.

Mayer (1979) has presented a checklist for attempting to determine if you have developed an effective organizer. He prefaces this checklist by indicating that, at present, there is no foolproof way to determine if you are developing an effective organizer. Using the Jello example just presented, let us examine Mayer's checklist. First, "Does the organizer allow one to generate all or some of the logical relationships in the to-be-learned material?" Does the Jello illustration communicate the essential concept that new and existing information can be mixed in at least two ways? If it does, then the Jello example meets this criteria for an effective organizer.

Second, "Does the organizer provide a means of relating unfamiliar material to familiar, existing knowledge?" The Jello illustration most certainly meets the criteria of familiar material. The concepts of correlative and derivative subsumption are generally unfamiliar to undergraduates in educational psychology courses. The Jello organizer then provides the means for relating unfamiliar to familiar material.

Third, "Is the organizer learnable, i.e., is it easy for the particular learner to acquire and use it?" The Jello example is quite simple and deals with materials with which the students are familiar. In addition, the illustration has the potential for being high in imagery, and students can imagine exactly what the Jello-and-marshmallow mixture would look like as it was being mixed.

Fourth, "Would the learner normally fail to use an organizing assimilative set for this material, e.g., due to stress or inexperience?" Undergraduate students in educational psychology have not typically conceived of the acquisition of new material in terms of the subsumptive process as described by Ausubel. The terms used are unfamiliar, and the tendency is for the student to rotely memorize the definitions of the two subsumptive processes without attempting to understand the logical processes being described. The Jello organizer is an attempt to preclude rote memorization of the terms and to provide a way of conceptualizing the subsumptive process by relating it to familiar materials.

Over and above the checklist provided by Mayer, there are other considerations that need to be reviewed. The situation should be examined in order to determine whether or not an advance organizer should be used at all. The advance organizer is only one of a number of effective pre-instructional strategies. Throughout all of the research reviewed, the characteristic that the material to be learned be unfamiliar to the learner

is cited over and over again. Before considering if an advance organizer should be developed, the instructional designer should have some evidence which suggests that the material being presented is unfamiliar to the learners. This evidence can be derived from a number of different factors: the complexity of the material, the lack of general experience of the learners due to age or educational background, or the level of cognitive development of the learners. Often the best evidence is obtained from teachers who have had consistently poor experiences in teaching a particular concept or topic. Such topics are the best candidates for an advance organizer.

Once the determination has been made that an advance organizer appears to be appropriate, the next step is to identify the central theme or concept in the material to be learned. That is, the teacher or instructional developer must ask, "What is the main point or theme of this unit of instruction?" The advance organizer must focus upon this major theme or concept. Unless this concept is identified clearly, the theme of the organizer may not be appropriate for the material to be learned. There must be a close correlation between the theme of the organizer and the theme of the material to be learned.

Instructional developers very often are interested in the use of media in the presentation of units of instruction. While there are only limited examples of research using non-verbal advance organizers, the media presentation should serve effectively as an advance organizer if it meets the criteria presented earlier. There is a caution which should be observed in the use of media. While visual media appear to be inherently more imagery-producing than verbal or written materials, there is no reason to automatically assume that this is the case. All of us have experienced media presentations which were not very interesting and which did not generate a great deal of imagery. A major criterion for the selection of media for use as an advance organizer is whether or not the media presentation focuses upon the major theme or concept of the material to be learned is not often done well.

The reader needs to be reminded of the work by Rickards (1975) in which he interspersed a number of short advance organizers within the material to be learned. While this procedure has not been reported except in the case of the teaching of reading, an instructional developer should seriously consider this use of an advance organizer. There is some evidence to suggest that in this use, the advance organizers function in two different roles. First, the organizer aids the student in summarizing what has already been read; this is not an advance-organizer role. Second, the interspersed organizer prepares the learner for reading what is to come; this is the advance organizer function. These interspersed organizers often take the form of questions of the prior material. Questions which require the learner to infer the answer from the prior material, rather than questions which elicit facts, appear to serve as advance organizers.

In the development of competency-based instructional programs, the developer often includes unit tests which must be mastered to criterion before the learner can continue. These unit tests, if they include a number of superordinate-level questions, could serve both as a measure of competency and as an advance organizer for the material to be read.

SUMMARY

Advance organizers at best provide a clear anchorage for the learner which assists him in learning unfamiliar material, and, at worst, are pre-instructional strategies which remain popular even though there is only minimal evidence that they facilitate learning and retention. The research available is confusing and unclear as to their value in the facilitation of learning. In this chapter, the major research sutdies and reviews have been summarized in order to give the reader a flavor of the state-of-the-art. While it may not be obvious to the reader, research focusing upon the advance organizer appears consistently in educational journals. While Barnes and Clawson presented a most negative conclusion concerning the facilitative effect of advance organizers upon learning, many of the other critical reviews have concluded that there is evidence that advance organizers do provide a small but consistent facilitative effect upon learning. The actual development of an advance organizer requires time and effort. While there is no evidence to support this hypothesis, the author of this chapter would suggest that the very act of identifying the major theme or concept of material to be presented could provide a focus and organization for the teacher which would result in greater achievement by the learners. Developing advance organizers remains an art rather than a science; there are no clear rules and procedures to follow. The proof of the effectiveness of any advance organizer lies in the achievement gains of the learners. If there is evidence that this gain in achievement occurs, then the material presented as an advance organizer is probably effective.

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